DATA MANAGEMENT

MODULE 7

MATHEMATICS 7

Distance Learning

Alberta EDUCATION

Mathematics 7

Module 7: Data Management

MODULE BOOKLET

Mathematics 7
Student Module
Module 7
Data Management
Alberta Distance Learning Centre
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Cover Photo: WESTFILE INC.

Welcome to Module 7!

We hope you'll enjoy your study of Data Management.

To make your learning a bit easier, a teacher will help guide you through the materials.

So whenever you see this icon,

turn on your audiocassette and listen.

CONTENTS AT A GLANCE

CONTENTS AT A GLANCE

MODULE INTRODUCTION

What Lies Ahead

In this Module Introduction you will preview the components of the Module and discover how the Module will be evaluated.

You will also learn why data management is important.

Working Together

Data influences your daily life. Each day you are bombarded with numerical information — the air temperature and humidity, the price of items in stores, your favorite sport team's scores, your weight.

Sometimes the data is presented as an average or displayed in a table or graph.

As you can see from the following examples, people collect, organize and interpret data to help them make decisions.

Many people use data in their personal lives.

Examples

Families use data to budget the money they spend and save.

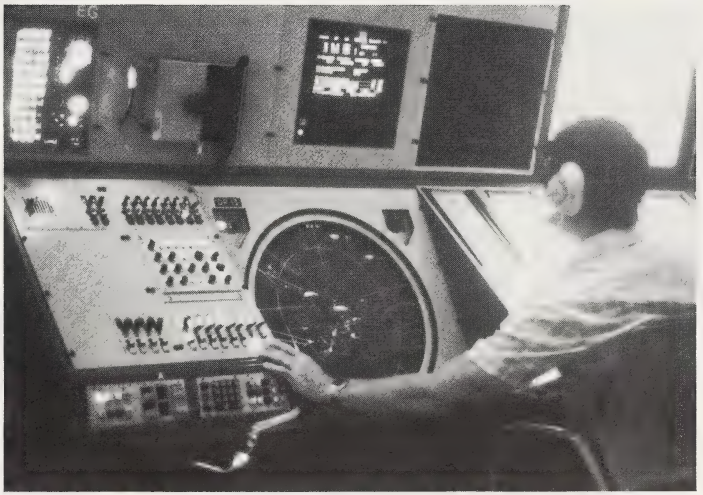
Many people use consumer reports to decide which products to purchase. For example if your family was purchasing a new appliance, you would probably compare the price, the size, the operating cost, and other data about various makes and models.

Many people use data in their careers.

Examples

Doctors collect and examine data about their patients such as body temperature, pulse, blood pressure before they treat them.

Airtraffic controllers must insure that there are safe distances between all aircrafts landing and taking off. They must take into account data such as height of plane, distance from the tower, rate of descent and length of runway.



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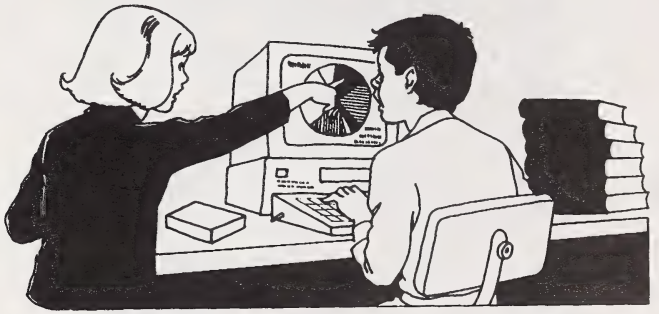
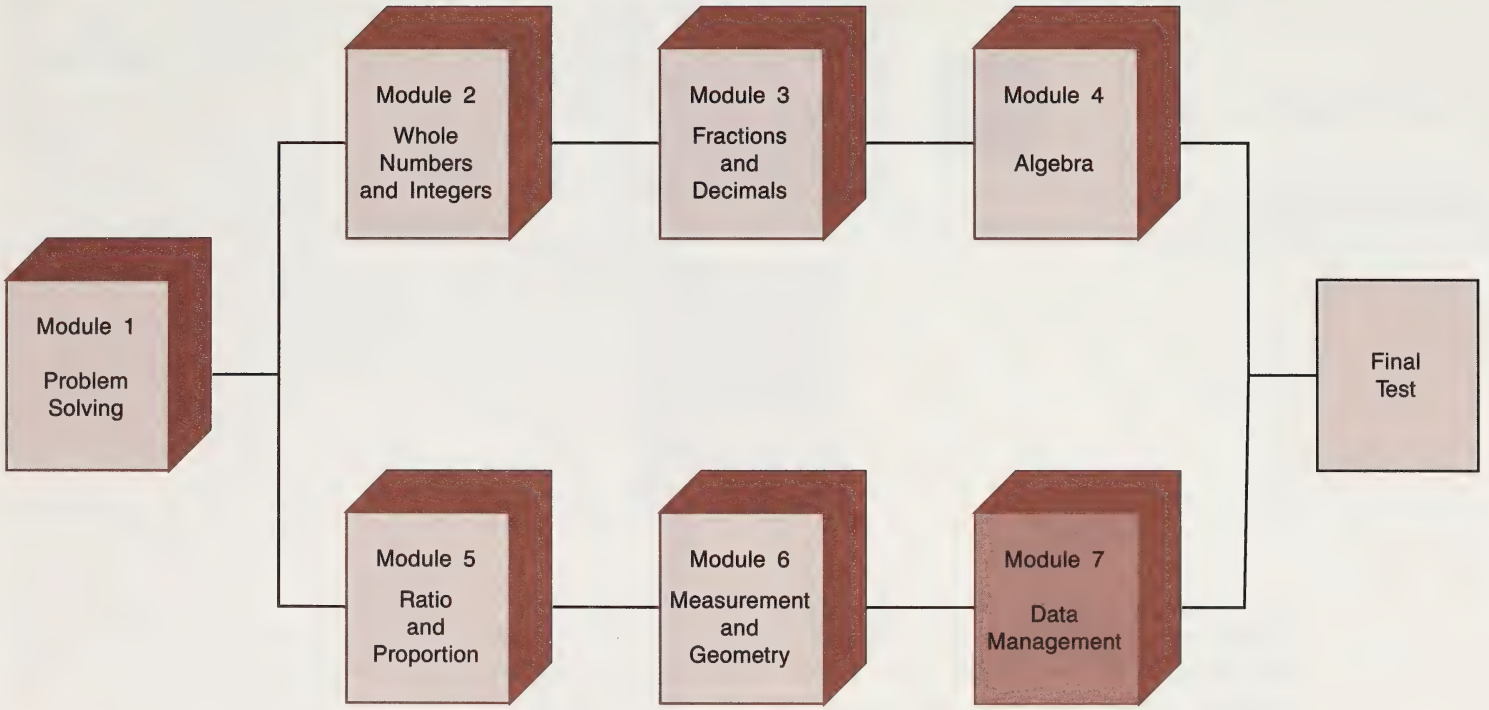
In this module you will learn to display data in tables and graphs.

You will discover that tables and graphs are widely used in everyday life — in books, on posters, and on computers.

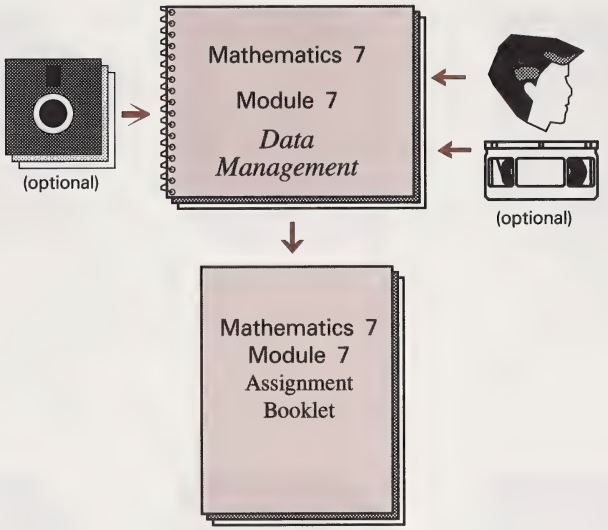


Course Overview



Mathematics 7 has seven modules and a final supervised test. This module booklet is part of Module 7.

Module 7 Components



This module booklet will give you instruction and practice in the skills and mathematical words you are required to learn. It will also direct you to the other components of the module. The computer and video activities in this booklet are optional. There are print alternatives. You should see your learning facilitator to check your answers to the activities in this module booklet.

This booklet is not to be submitted for a grade. **Your mark on this module will be determined by your work in the assignment booklet.**

Take time to preview this module booklet before beginning Section 1.

What Lies Ahead

This section will test these skills.

- calculating averages
- keeping tallies and making frequency tables
- constructing and interpreting pictographs, bar graphs, line graphs and circle graphs
- choosing the most appropriate graph

Working Together

This section tests skills with data management that will be presented in this module.

The pretest will help you and your learning facilitator discover your strengths and weaknesses.

Pretest

Space for Your Work

1. Caroline and Shauna looked over job-offers for students for summer employment. Use the chart at the right to answer the following questions.

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Job	Pay Per Hour
Pool Attendant	$4.95
Gas Pump Attendant	$3.75
Waiter/Waitress	$4.00
Child Care Worker	$4.75
Rock Picker	$5.00
General Farm Worker	$4.80
Grass Cutter (for city parks)	$5.00
Office Worker (typing, filing)	$5.25
Cashier	$4.75
Babysitter	$2.00

a. What is the lowest and highest rate of pay?

b. What is the average rate of pay for the above jobs?

Space for Your Work

2. The students in grade 7C were asked how many teeth fillings they had during their lifetimes.

They responded as follows.

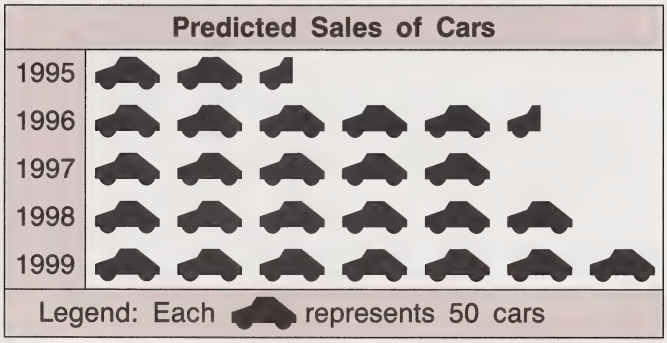
3, 4, 5, 8, 2, 0, 6, 7, 4, 4,
8, 6, 1, 1, 4, 6, 3, 5, 7, 4,
1, 2, 3, 0, 0, 2, 5, 6, 2, 1,
0, 4, 3

Complete the tally chart and find the frequency for each number of fillings.

Number of Fillings	Tally	Frequency
0	||||	4
1		
2		
3		
4		
5		
6		
7		
8		

Space for Your Work

3. Super Charge Vehicles Ltd. are predicting their sales of electric cars. The first automobile will be a 4-seater Hummalong. With its large battery it is expected to go 250 km before the battery would need to be recharged. Recharging should only take 1½ hours. The predicted sales are displayed in this graph. Study this graph. Then answer the following questions.



a. How many cars would be presented by ?

b. In which year should the production be over 300 vehicles?

c. If the car sells for $16 000, how much would the company expect to earn in 1995?

Space for Your Work

4. Study this graph. Then answer the following questions.

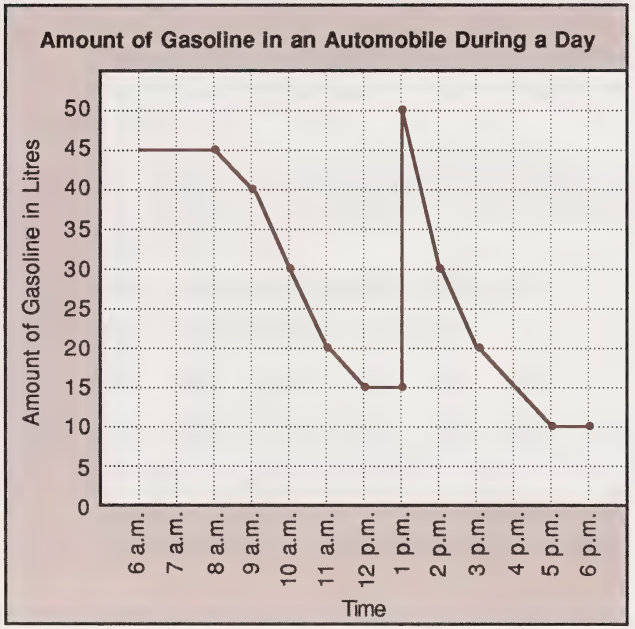
a. Which language is spoken by the greatest number of people?

b. About how many people speak English?

c. About how many people speak French?

Space for Your Work

5. Study the graph below. Then answer the following questions.



Space for Your Work

a. When did the driver of the car leave home?

b. When did the driver eat lunch?

c. When did the driver arrive home?

d. What do you think the driver does for a living? Why?

e. When did the driver fill up the gas tank?

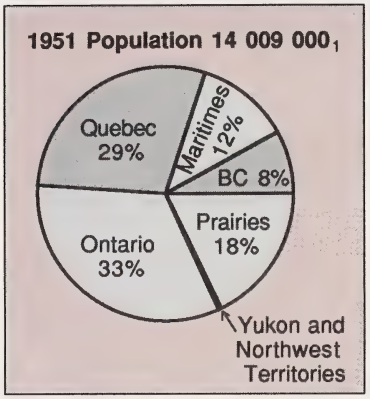
f. How much gas did the driver purchase?

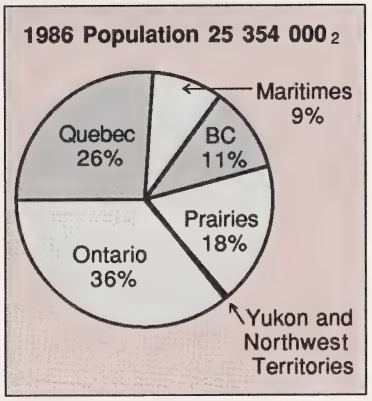
g. What is the capacity of the tank?

h. How much gas is left in the tank at 6 p.m.?

Space for Your Work

6. Study these graphs. Then answer the following questions.





Note

The Yukon and Northwest Territories are included as lines on these graphs because their population is less than 1% of the total population of Canada.

[1,2]Statistics Canada.

Space for Your Work

a. In what regions of the country did the percentage of population increase from 1951 to 1986?

b. What was the total population of Canada?

(i) in 1951

(ii) in 1986

c. Calculate the population of the Prairies.

(i) in 1951

(ii) in 1986

Space for Your Work

7. Make a pictograph to represent this data.[1]

Automobiles Registered in Canada in 1986	
Newfoundland	176 000
Nova Scotia	337 000
Prince Edward Island	56 000
New Brunswick	286 000
Quebec	2 614 000
Ontario	4 244 000
Manitoba	527 000
Saskatchewan	389 000
Alberta	1 296 000
British Columbia	1 527 000
Territories	25 000

Automobiles Registered in Canada in 1986	
Legend:	

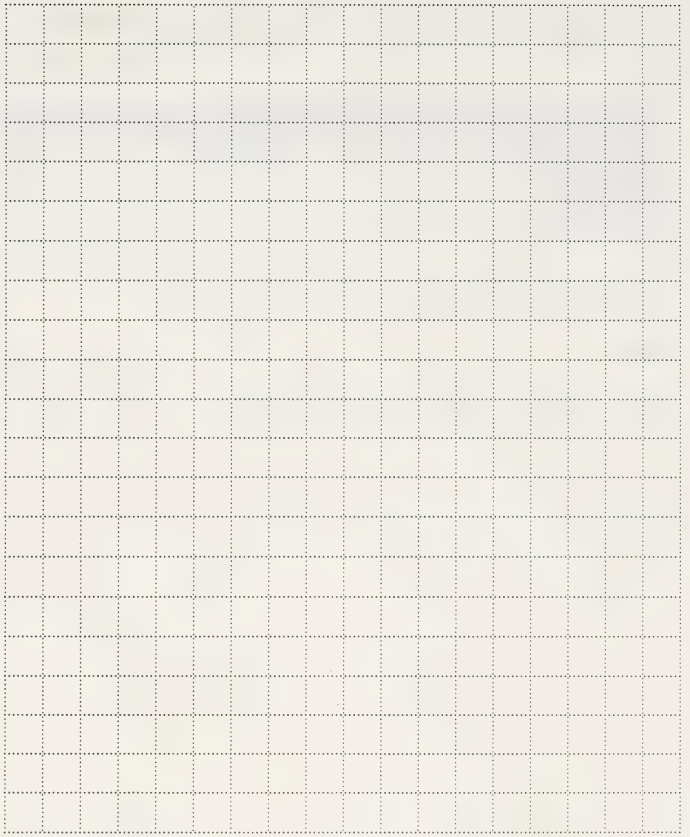
[1]Statistics Canada.

Space for Your Work

8. Make a bar graph to represent this data.[1]

The Longest Rivers in Canada

River	Length
Mackenzie	4 241 km
Yukon	3 185 km
St. Lawrence	3 058 km
Nelson	2 575 km
Columbia	2 000 km
Saskatchewan	1 939 km
Peace	1 923 km
Churchill	1 609 km
South Saskatchewan	1 392 km
Fraser	1 370 km
North Saskatchewan	1 287 km
Ottawa	1 271 km



[1]Statistics Canada.

Space for Your Work

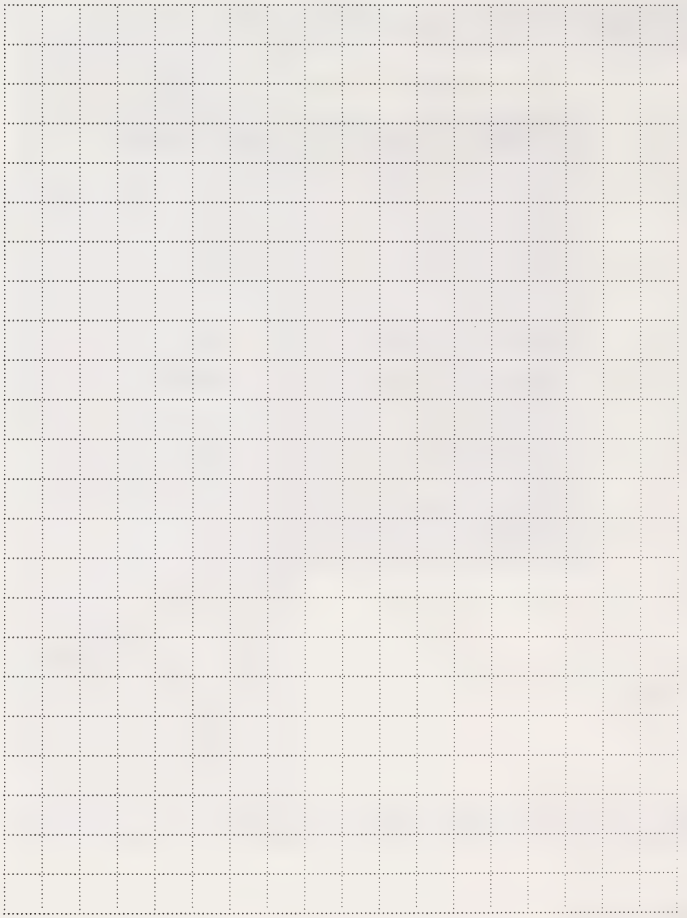
9. Teresa's parents kept a baby book and recorded her height at birth and on every birthday.

Theresa's Growth											
Age (a)	birth	1	2	3	4	5	6	7	8	9	10
Height (cm)	51	76	86	94	101	104	115	119	130	135	141

Make a line graph to display this data.

Note

The metric symbol for years is a.



Space for Your Work

10. Make a circle graph to display this data.

Money Raised by Student Council	
Student Cards	12 000
Canteen	6 000
Dances	2 000
Athletics	10 000
Fund raiser	10 000
Total	40 000

Space for Your Work

11. What graph would you use to display the following.

    a. the change in the price of an average single-family house during the years 1980 to 1990

    b. the different ways an average family spends its yearly income in 1990

    c. the amount of garbage disposed of in major cities in Canada in 1990

    d. the number of students in school districts in Alberta in 1990

See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead

In this section you will learn about these topics.

- the meaning of average
- the importance of averages
- how to calculate averages

Working Together

In this section you will learn about averages.

Sometimes average is used as a synonym for *usual, typical* or *normal*.

Consider the following questions:

- How tall is a man?
- How heavy is an elephant?
- How long do people live?
- How much does a litre of gasoline cost?

You probably answered these questions from your experiences and readings. You may have answered this way:

- A normal-sized man is 1.75 m tall.
- A typical elephant has a mass of 4 t.
- People usually live about 72 a.
- Generally the cost of a litre of gasoline is 50¢.

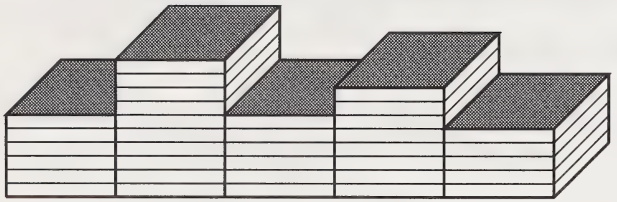
Note

- t is the symbol for tonne.
- a is the symbol for years.

Calculating Averages Mathematically

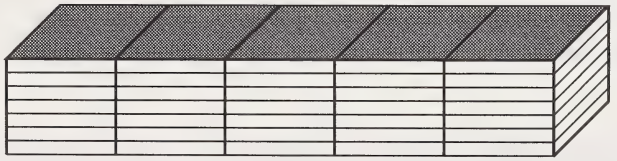
Example 1

The teacher sent Linda, Debbie, Shelley, Max and Barney to the storeroom to get textbooks. Each person carried some textbooks back to the classroom and placed the books in a stack. Each student carried a different number of textbooks. What was the average number of books each student carried?



Solution

One way to calculate the average would be to place the same number of books in each stack.



There were 7 books in each stack. 7 is the average number of books each student carried.

Here is another way to find the average.

- find the total number of books:

$$6 + 10 + 6 + 8 + 5 = 35$$

- divide that total by the number of stacks:

$$35 \div 5 = 7$$

The average number of books each student carried was 7.

Example 2

A group plans to go canoeing on the Athabasca River. They plotted out where they would camp each night and how far they would travel each day.

Day 1	27 km
Day 2	38 km
Day 3	19 km
Day 4	32 km
Day 5	26 km
Day 6	22 km
Day 7	31 km
Day 8	21 km

What is the average distance they will travel each day.

Solution

Step 1: Find the total distance they will travel.

$27 + 38 + 19 + 32 + 26 + 22 + 31 + 21 = 216$

Step 2: Divide the total distance they will travel by the number of days they will be travelling.

$$216 \div 8 = 27 \text{ km}$$

The average distance they will travel each day is 27 km.

Practice Activities

Space for Your Work

1. Here are Lisa's marks for all her projects and tests. (They are all out of 100.)

	Marks									
1st term	62	51	64	73	47	43	84	50	60	40
2nd term	45	70	83	90	64	80	65	52	50	80

   a. Calculate her average for 1st term.

   b. Calculate her average for 2nd term.

   c. Did her average go up or down from the first to the second term?

   d. If her final mark was based on all 20 marks, what would her final mark be?

Space for Your Work

2. Michael Vroom was buying a new Canuck Compact car. He shopped around and got the cost from several car dealerships. All the cars came with the same equipment.

Dealers	Cost
Northern Fast-track Ltd.	$8 975
Chevi Nicki Auto Sales Ltd.	$8 265
Western Plains Sales Ltd.	$9 420
Ted Blonkers Auto Sales Inc.	$7 999
Denny André Sales Inc.	$8 366
Benny's Best Cars Ltd.	$7 968
East Town Car Dealers Ltd.	$7 999

a. What is the average cost of a Canuck compact car?

b. Should Michael have an interest in knowing the average price of a car? Why or why not?

Space for Your Work

3. Angela thought that Junior High students watched more television than Elementary students. She did some research and asked students how many hours of television they watch per week-nights.

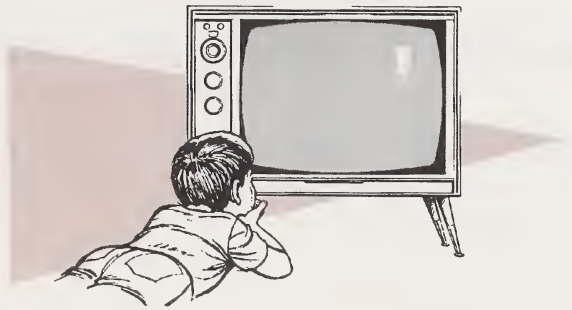
   - The responses from the Elementary students were as follows:

     0, 2, 4, 3, 2, 0, 0, 4, 3, 1, 1, 1, 4, 3, 0

   - The responses from the Junior High students were as follows:

     3, 2, 3, 4, 0, 1, 1, 4, 6, 0, 0, 4, 3, 1, 0, 1

   a. Find the average hours of television watched by both groups.



   b. Which group watches more television?

Space for Your Work

4. Bill Lastiwka and Mike Naidu are goaltenders for the Bear Creek Bruins. Both players have played 10 games. You have the following data.

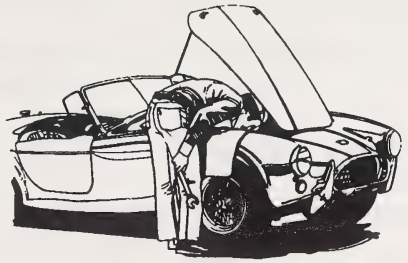
	Goals Allowed Per Game									
Bill Lastiwka	4	2	3	2	7	0	4	9	6	3
Mike Naidu	8	2	4	1	2	3	6	6	0	1

a. Find the average number of goals that Bill Lastiwka and Mike Naidu lets into his net.

b. Which goalie has the better average? Explain.

Space for Your Work

5. The average income for auto mechanics at several garages are given in the chart at the right.



Garages	Salary
Northern Fast Track Ltd.	$27 400
Chevi Nicki Auto Sales	$26 800
Western Plains Sales	$26 700
Ted Blonkers Auto Sales	$24 900
Denny André Sales	$31 200
Benny's Best Cars Ltd.	$30 400
East Town Car Dealers	$24 700
Auto City Sales	$25 400
Astros Auto Sales	$26 200
Southern Car Dealer	$22 500

a. Find the average income of an auto mechanic from the above information.

b. Which garage pays more than the average?

See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

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1. Mrs. Mudryk is retired, but she is studying anthropology by distance education. She has one more test to write before she completes the course. In order to pass she must get an overall average of 50. Altogether she has to take 8 tests. In the first 7 tests she has the following (all marks are out of 100).

Test	1	2	3	4	5	6	7	8
Marks	55	45	40	50	50	70	60	—

   a. If she gets 50 on the final test, will she pass the course? (Show your calculations.)

   b. If she gets 75 on the final test, will she pass the course? (Work out her average mark assuming she did get 75%.)

Space for Your Work

c. What is the lowest mark she can get on the final test and still pass the course? (Show your calculations.)

2. Mr. Hallowaychuck is transporting 27 hogs. He estimates the average weight of the hogs to be 90 kg.

a. If he can get $1.20 per kg, how much does he expect to get for his shipment of hogs?

Space for Your Work

b. The hogs actually weighed 2 501.2 kg. How much did Mr. Hallowaychuck actually receive?

See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead

In this section you will learn to make tallies and frequency tables.

Working Together

Probably after a good hunting expedition early people recorded how many animals they killed by making drawings.

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You will discover in a later section, that pictures are sometimes still used today. However, people usually want a simpler way to record and organize information. This section deals with two ways of recording and organizing information — tallies and frequency tables.

Tallying

Pretend you are the goal judge at a hockey game between the Bears and the Cougars. It is your job to make a mark or tally everytime a team scores a goal. You are given the score card below.

Bears	
Cougars	

Every time one of the teams score you make a vertical stroke. (This is called a **tally**).

At the end of the game, you have recorded all the goals and the scorecard looks like this:

Bears	||||||||
Cougars	|||||||||||

Now to find out who won the game you add up the tallies. You see the Bears got 8 goals while the Cougars got 11. So the Cougars won by 3 goals.

Tally marks can be made easier to count by arranging them in bundles of 5. The first four tallies are made vertically, but the 5th tally goes diagonally across the other tallies and puts them into a bundle of 5. Study the following examples.

Number	Tally
5	𝍸
6	𝍸 |
7	𝍸 ||
8	𝍸 |||
9	𝍸 ||||
10	𝍸 𝍸

You can see by arranging tallies in bundles of 5, that it is much easier to later count the tallies.

Going back to your hockey game, you can now see that the tallying might have been done like this:

Bears	𝍸 ||||
Cougars	𝍸 𝍸 |

Introductory Activities

Space for Your Work

1. Write the number that these tallies represent.

   a. 𝍸

   b. 𝍸 |||

   c. 𝍸 𝍸 ||

   d. 𝍸 𝍸 𝍸 ||||

   e. 𝍸 𝍸 𝍸

   f. 𝍸 𝍸 𝍸 𝍸 𝍸

   g. ||

   h. ||||

   i. 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸

   j. 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 ||

2. Write down how you would record each number as a tally.

   a. 10

   b. 22

   c. 34

   d. 13

   e. 25

Space for your Work

3. Betty Hindman and Arthur Clark wanted to find out which types of automobiles were the most popular in Vancouver. Both students went to busy spots and kept a tally of the cars they saw over a 15 minute period. The results are shown below.

Make of Auto	Arthur Clark's Results	Betty Hindman's Results
Honda	𝍸 |	|||
Nissan	𝍸 𝍸 𝍸	𝍸 𝍸 𝍸 𝍸 |
Mazda	||	
Ford	𝍸 𝍸 𝍸 𝍸 ||	𝍸 𝍸 𝍸 𝍸 ||||
General Motors	𝍸 𝍸 𝍸 𝍸 |||	𝍸 𝍸 𝍸 𝍸 ||
Chrysler	𝍸 𝍸 |||	𝍸 |||
Others	𝍸 ||	𝍸

a. Which kind of automobile was seen most by Arthur?

b. Which kind of automobile was seen most by Betty?

Space for your Work

c. Which kind of automobile was seen least by Arthur?

d. Which kind of automobile was seen least by Betty?

See your learning facilitator to check your answers and to receive further instructions.

Working Together

As you have seen already, tallying is a way of recording events. Sometimes tallies are organized into tables.

Example

Lucy Fernandez is a college student. She was doing a project, she wanted to know what kinds of food teenagers liked best. So she asked the 75 students in three grade 7 classes, "If you could choose your favorite food to eat, what would it be?" Lucy recorded the results of her study in a chart.

Here are the results.

Food	Tally	Frequency
Pizza	𝍸 𝍸 𝍸 ||	17
Sub Sandwich	𝍸 |	6
Chinese	𝍸 𝍸 𝍸	15
Steak	𝍸 𝍸 𝍸 |	16
Fish	𝍸 |	6
Burger	𝍸 |||	8
Something else	||	2
Total		70

As can be seen the **frequency** is the total of the tally marks for each possible choice. It tells how many times a certain thing occured.

The frequency of pizza being chosen was 17, or the frequency of steak being chosen was 16.

The chart is called a **frequency table**.

Practice Activities

1. Below is the Sports, Racing Car section from the Classified section of a newspaper. Use the information in the advertisements to complete the frequency table at the right.

Sports, Racing Cars & Parts 980

1986 CORVETTE, racing red, loaded. 555-3311.

1976 TR6, maroon, all work done, A-one cond. $9 000. 555-1350

1989 NISSAN 240 SX, 5 spd., racing red, only 9 500 kms. $17 900. 555-9970.

1989 MUSTANG, 16 valve engine, 5 spd., low kms. $17 900. 555-9970.

1973 PORSCHE 911E Targa, one owner, $12 900. 555-8868 or 555-7464.

1987 JAGUAR Soverign, fully loaded, immaculate cond., 1 owner. Serious enq. only. 555-3808 or 555-7128.

CONVERTIBLE '83 Mustang GLX 5.0L, 4 spd., silver, red interior. Well maint'd. $10 900. 555-2219 evg's.

1988 Pontiac Grand Prix SE, fully loaded, upgraded stereo, pwr. seats, windows & locks. Fuel injected. Only 30 000 kms. $17 500. 555-6482.

1981 Jaquar XJ6, black, 70 000 mi, exc. cond., $19 800 obo. 555-4650.

1977 MGB Mark IV, gold, engine & drive train exc. $2 800 obo. 555-3517.

1971 RED Corvette, 350, LT1, 5 spd., restored, $22 000 obo. 555-0703.

Sports, Racing Cars & Parts 980

1986 BMW 325E, 2 dr., navy blue, 43 000 kms. $19 000. 555-0311.

1980 CAMARO Z28, gold, no rust, T-roof, 350 v8, dual exhaust, headers, Kenwood stereo system, car cover & bra, $5 300. 555-9394.

PORSCHE TARGA softback. Very rare. Leather, 5 spd., new paint & top. $18 000, obo. 555-4725.

1974 TRIUMPH TR6. Reconditioned. Rust free. $8 900. 555-3634.

1980 MG Midget, Excellent condition, $4 250/obo, 555-0765.

1980 PORSCHE 924 Turbo. Air, p.w., glass sunroof, etc. Not winter driven. Exc. cond. Ph. 555-0039.

1982 PORSCHE (1982) 30 000 original kms., S. pkg., all leather, alarm, dark blue. $33 333. 555-6743 days/after hrs. 555-9873.

1984 CORVETTE, only 8 000 mi., very nice, $25 900. 555-3980.

1984 MERCEDES 500 SEL Dark gray, immac. $49 900. 555-0612.

Space for Your Work

Kind of Car	Tallies	Frequency
BMW		
Corvette		
Jaguar		
Mercedes		
Mustang		
Nissan		
Porsche		
Other		
Total		

Space for your Work

2. Below is a list of radio stations. Use the information provided to complete the frequency table at the right.

   CBC (Multi-Format)
   CFCW (Country)
   CFOK (Country)
   CFRN (Oldies)
   CHED (Rock-top 40)
   CHFA (French)
   CHMG (Classic Gold)
   CHQT (Easy Listening)
   CIRK (Rock)
   CISN (Country)
   CJCA (News/Talk)
   CJKE (Easy Listening)
   CJSR (Contemporary)
   CKER (Ethnic)
   CKNG (All Hit)
   CKRA (Soft Rock)
   CKUA (Multi-Format)

Category	Tallies	Frequency
Multi-format		
Country		
Rock		
Easy listening		
Other		
Total		

Concluding Activities

Space for your Work

Mr. and Mrs Vandenberg raise hens. Below is a frequency table of the number of eggs they sell over a 2 week period. Use the data in the table to answer the following questions.

First Week	Number of Eggs	Second Week	Number of Eggs
Sunday	243	Sunday	242
Monday	242	Monday	294
Tuesday	191	Tuesday	283
Wednesday	269	Wednesday	225
Thursday	270	Thursday	236
Friday	245	Friday	267
Saturday	258	Saturday	271

Space for your Work

1. Find the average number of eggs they get daily in the first week.

2. Find the average number of eggs they get daily in the second week.

3. How many dozen eggs can they agree to supply to their customers each day? (Hint: there are 12 eggs in a dozen)

See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead

In this section you will learn these skills.

- interpreting pictographs
- constructing pictographs

Working Together

In Section 1 you read about how ancient people might have drawn pictures on the cave walls to record their hunting exploits. The pictures of the animals on the cave wall may well have been the world's first pictograph.

A **pictograph** is data shown to us in symbols that represent numerical information. As its name implies, a pictograph is a little picture that has some relationship to the topic.

Each pictograph has a legend. The **legend** explains what the symbols mean.

Each pictograph has a descriptive title.

Example

A town library was established in 1958. Since then it has improved its service and the number and quality of books. The following summarizes the growth of the library.

Number of Books at Hampton Library	
1958	
1968	
1978	
1988	
Legend: Each  represents 1 000 books	

Compare the pictograph to the following frequency table.

Number of Books at Hampton Library

Year	Number of Books
1958	1 012
1968	6 082
1978	7 015
1988	12 003

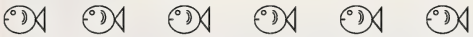
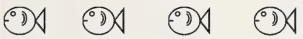
Notice that the pictograph is more effective in showing that the number of books is rising steadily!

You should remember however that the information in a pictograph is **not** always accurate; it is often approximate.

Sometimes a whole symbol is used in a pictograph. At other times fractions of the symbol are used.

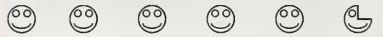
Example 1

The fish and wildlife authorities try to keep accurate records of how much fish is taken from commercial fishing lakes. Over the last five years data has been kept on Big Whitefish Lake.

Fish Caught in Bigwhite Lake	
1984	
1985	
1986	
1987	
1988	
Legend: Each  represents 500 kg of fish	

Note:  = 250 kg of fish (½ of 500 kg of fish)

Example 2

Populations of Alberta Cities (1986)[1]	
Calgary	
Edmonton	
Lethbridge	
Red Deer	
Grande Prairie	
Legend: Each  represents 100 000 people	

Note:  = 75 000 (¾ of 100 000)

 = 50 000 (½ of 100 000)

 = 33 000 (⅓ of 100 000)

 = 25 000 (¼ of 100 000)

[1]Statistics Canada.

Introductory Activities

Space for Your Work

1. Use the pictograph below to answer the following questions.

Stanley Cup Winners (1959 — 1990)	
Montreal Canadians	🏆🏆🏆🏆🏆🏆🏆🏆🏆🏆🏆🏆
Chicago Black Hawks	🏆
Toronto Maple Leafs	🏆🏆🏆🏆
Boston Bruins	🏆🏆
Philadelphia Flyers	🏆🏆
New York Islanders	🏆🏆🏆🏆
Edmonton Oilers	🏆🏆🏆🏆🏆
Calgary Flames	🏆
Legend: Each 🏆 represents 1 Stanley Cup	

a. Which hockey team won the most Stanley Cups from 1959-1989?

b. How many Stanley Cups did the Edmonton Oilers win?

c. How many Stanley Cups did Calgary Flames win?

Space for Your Work

2. Use this graph to answer the following questions.

Number of Passengers at Canada's Busiest Airports (1985)[1]	
Toronto	
Montreal (Dorval)	
Vancouver	
Calgary	
Winnipeg	
Legend: Each  represents 100 000 passengers.	

a. Which is Canada's busiest city?

b. Does Vancouver airport handle more passengers than Montreal (Dorval)?

c. How many more passengers were handled in Vancouver than in Calgary?

[1]Statistics Canada

Space for Your Work

3. Use the pictograph below to answer the following questions.

Number of Cars Sold by Big Auto City Sales (1991)	
Jan.	
Feb.	
Mar.	
Apr.	
May	
June	
July	
Aug.	
Sept.	
Oct.	
Nov.	
Dec.	
Legend: Each  represents 10 cars sold	

Space for Your Work

a. How many cars were sold in these months?

   (i) August 1990

   (ii) December 1990

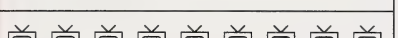
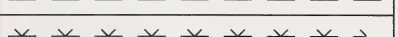
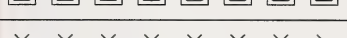
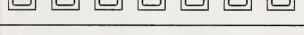
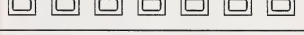
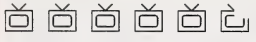
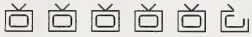
b. How many more cars were sold in June than in January?

c. If each car was sold for $12 000, how much was brought into the business in April?

d. Does this pictograph tell you clearly which are the best and worst months for car sales?

Space for Your Work

4. Use the pictograph below to answer the following questions.

Longest-Running Canadian TV Shows (up to end of 1987-1988 season)	
Hockey Night in Canada	
CFL Football	
Country Canada/Country Calendar	
Front Page Challenge	
The Nature of Things	
The Friendly Giant	
Hym Sing	
The Tommy Hunter Show	
Wide World of Sports	
W-5	
Legend: Each  represents 4 seasons	

Space for Your Work

How many seasons had the following shows run up to the end of 1987-1988 season.

a. Hockey Night in Canada

b. Front Page Challenge

c. W-5

See your learning facilitator to check your answers and to receive further instructions.

Practice Activities

Space for Your Work

These were the top money-making films up to 1987.

Film	Total Rental
E.T. The Extra Terrestrial (1982)	$227 960 804
Star Wars (1977)	193 500 000
Return of the Jedi (1983)	168 002 414
The Empire Strikes Back (1980)	141 600 000
Jaws (1975)	129 961 081

Construct a pictogram to display this data. Use  to represent $30 000 000.

Legend:	

See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead

In this section you will learn these skills.

- interpreting a bar graph
- constructing a bar graph

Working Together

You have just finished a section on pictographs. You'll remember that pictograph showed information by giving us a little picture of what the numbers were trying to reflect.

In this section you will learn about bar graphs.

Do you recall the example about the growth in the number of books in the Hampton Library.

Number of Books at Hampton Library

Year	Number of Books
1958	1 012
1968	6 082
1978	7 015
1988	12 003

In the previous section you displayed this information in a pictograph.

Number of Books at Hampton Library

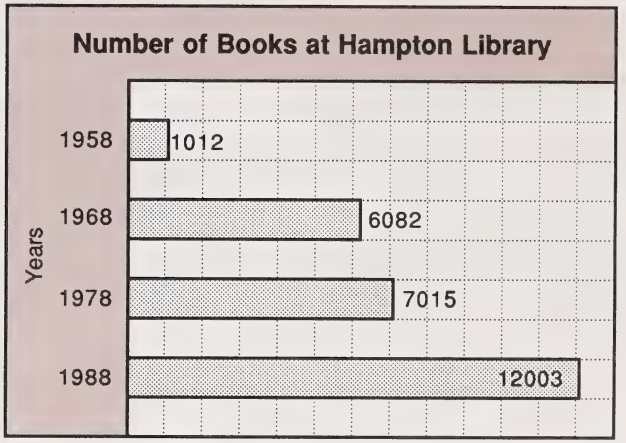
1958	1 book
1968	6 books
1978	7 books
1988	12 books

Legend: Each book represents 1 000 books

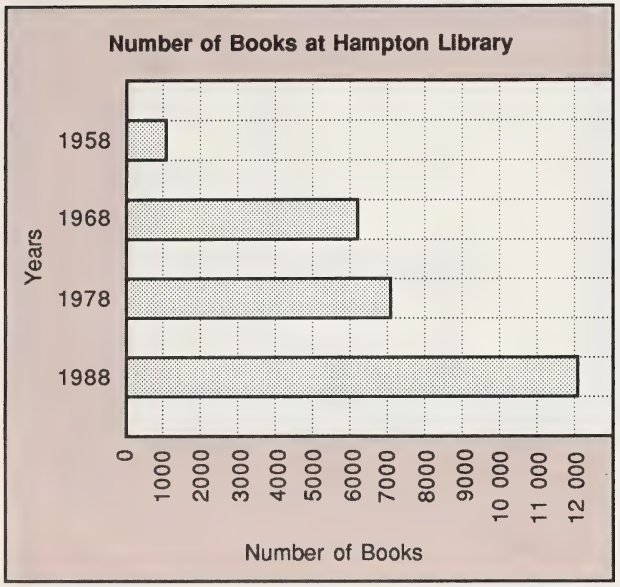
This information can also be displayed in a bar graph.

In a bar graph, bars are used instead of pictures.

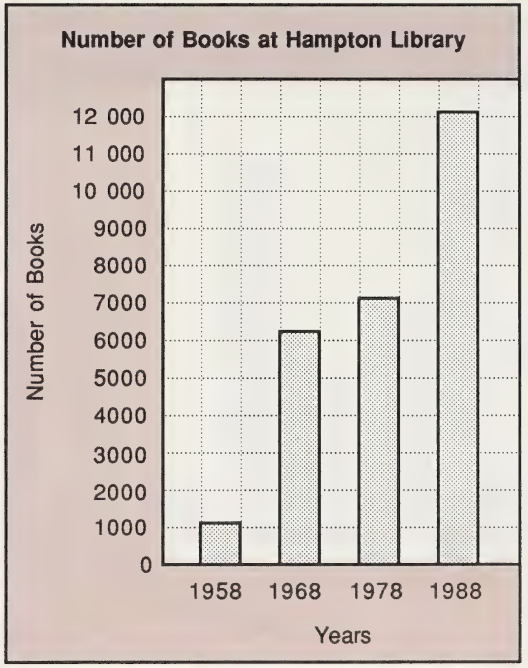
Sometimes bar graphs can have the data recorded beside the bars.



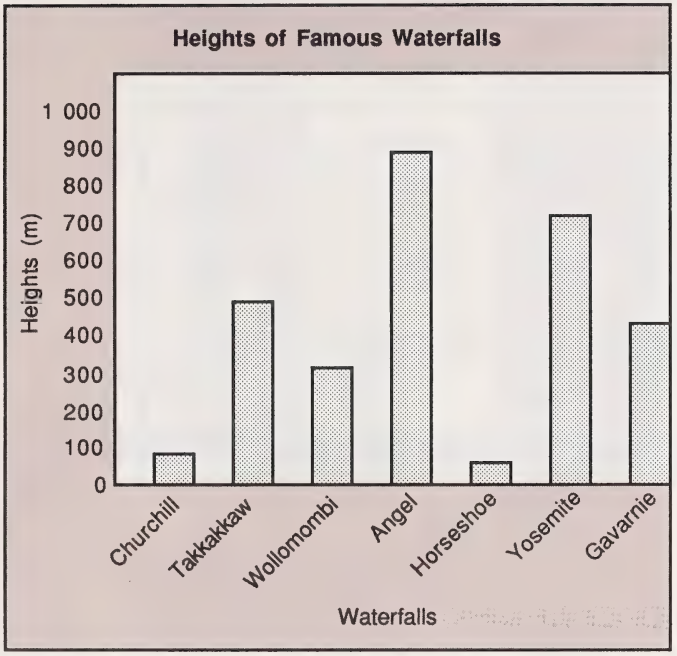
Often bar graphs have a scale. Here the scale is along the bottom of the graph. You can use the scale to "read" the graph and determine the approximate size of the bars. The guide lines help you.



Here the scale is labeled on the left side of the graph.

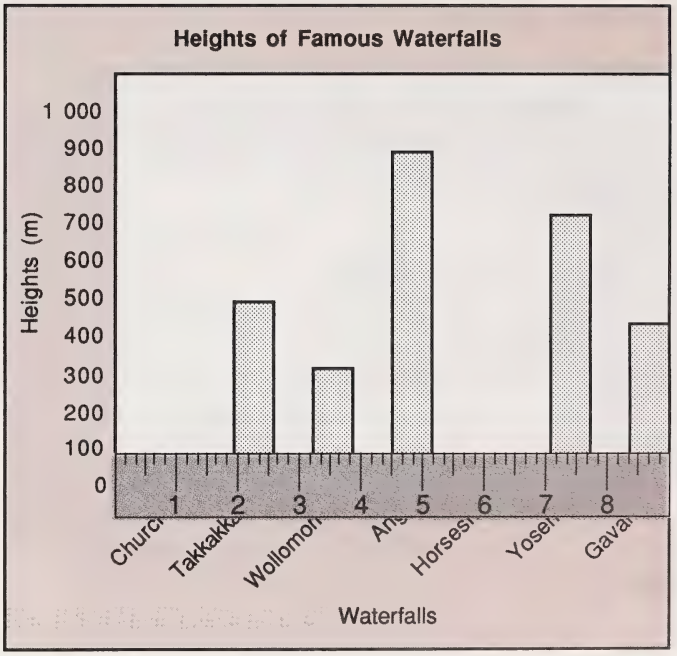


In the following bar graph the guide lines are not included.



You may need to use a straightedge to help you read the scale across from the bar.

Example: What is the height of Churchill Falls?

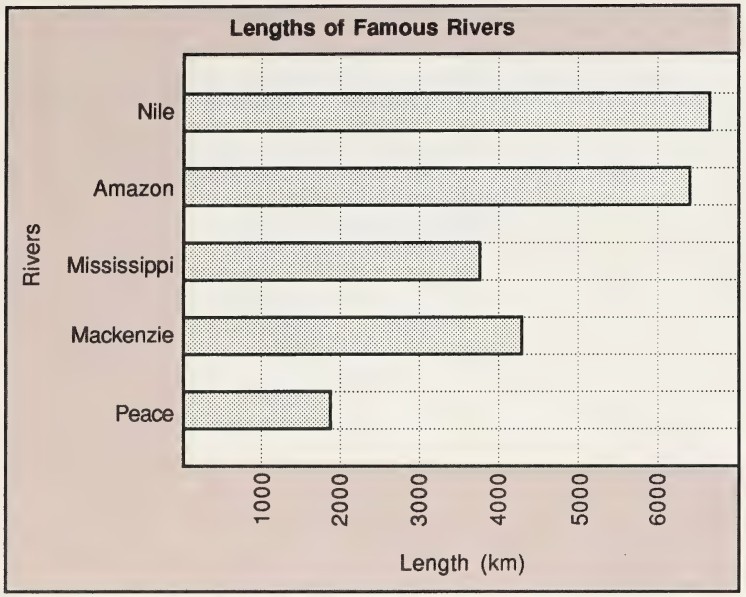


The height of Churchill Falls is about 80 m. (You will have to estimate because the bar is between the 0-m mark and the 100-m mark on the vertical axis).

Introductory Activities

Space for Your Work

1. Use the bar graph below to answer the following questions.



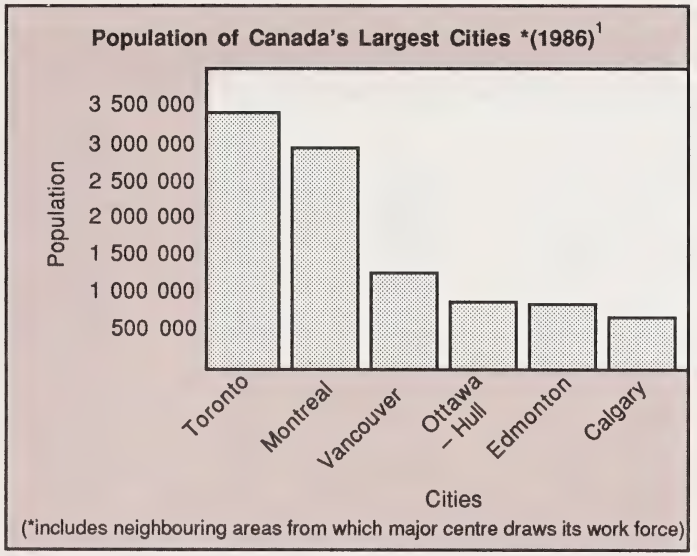
a. How long is the Amazon River?

b. How long is the Nile River?

c. How long is the Peace River?

Space for Your Work

2. Use the graph below to answer the following questions.



[1]Statistics Canada.

Space for Your Work

a. How many people live in Calgary?

b. How many people live in Montreal?

c. How many people live in Vancouver?

See your learning facilitator to check your answers and to receive further instructions.

Working Together

Constructing a Bar Graph

Bar graphs should have these features

- a descriptive title
- a horizontal and a vertical axis which are named accurately
- good use of space (appropriate scale)
- bars equal in width and equally spaced

The most difficult part of making a bar graph is choosing an appropriate scale. To do this consider the data you wish to display.

What is the highest number? What is the lowest number?

This will help you decide what each unit should be.

Be sure to make good use of space.

Example

Construct a bar graph using this data.

Average Single Family Housing Price in 1987[1]

City	Price ($)
Winnipeg	78 286
Regina	65 078
Saskatoon	72 977
Edmonton	77 373
Calgary	93 102
Vancouver	132 658

Note

The highest is $132 658.

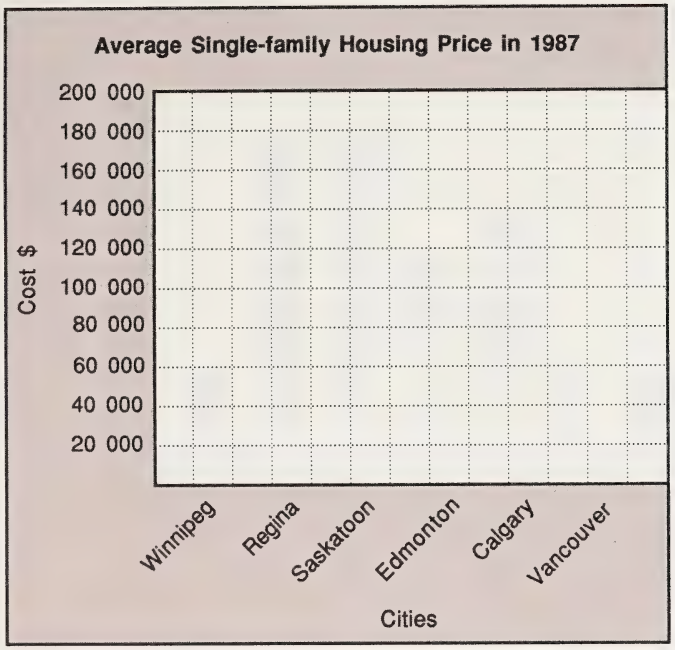
The lowest is $65 078.

You may wish to make each unit $20 000.

[1]Statistics Canada.

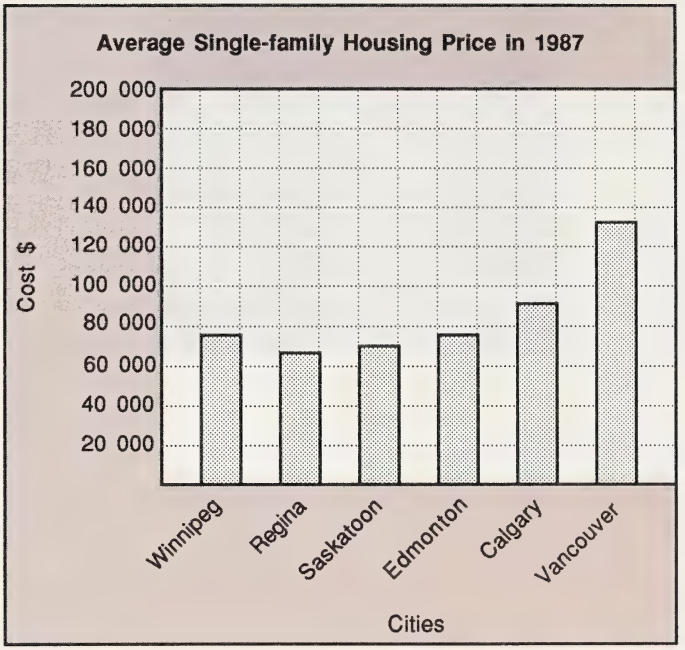
Step 1

Label the title and axis (including the scale).



Step 2

Make the bars. You will have to approximate the cost.



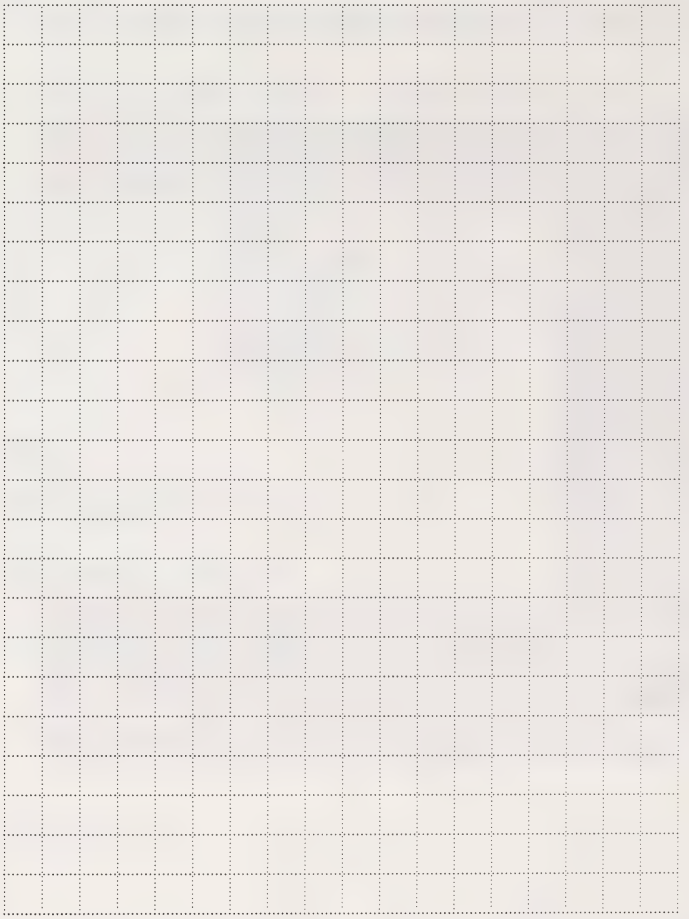
Practice Activities

Space for Your Work

Construct a bar graph to display the following data.

Population by Continents, 1988

Asia	3 031 100 000
Europe	684 800 000
Africa	615 300 000
Australia	25 500 000
North America	413 100 000
South America	282 200 000

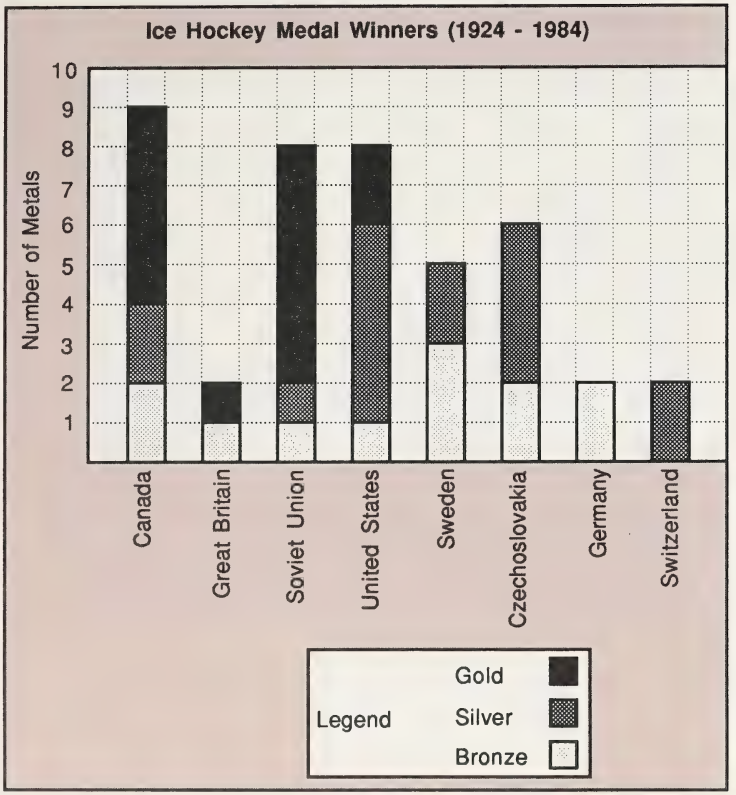


See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

Space for Your Work

1. Use the graph below to answer the following questions.



Space for Your Work

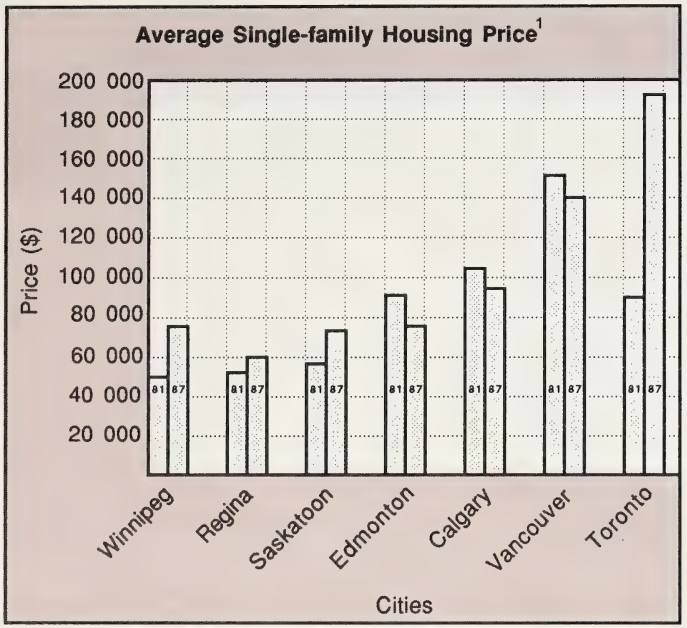
a. Which country won the most medals?

b. The Soviet Union and United States won the same number of medals. Which country won the most gold?

c. Which countries have won gold medals?

Space for Your Work

2. Use the graph below to answer the following questions.



[1]Statistics Canada.

Space for Your Work

a. In which city did houses cost the most?

   (i) in 1981

   (ii) in 1987

b. Which city had the most economical houses?

   (i) in 1981

   (ii) in 1987

c. In which city did prices increase the most between 1981 and 1987?

Space for Your Work

3. Draw a bar graph to illustrate the following.

Precipitation for Cities in Canada[1]

	Millimetres of Precipitation				
Month	**St. John's**	**Montreal**	**Ottawa**	**Winnipeg**	**Vancouver**
January	156	72	61	21	154
July	75	90	86	76	32

See your learning facilitator to check your answers and to receive further instructions.

[1]Statistics Canada.

What Lies Ahead

In this section you will learn these skills.

- interpreting a line graph
- drawing a line graph

Working Together

So far you have studied the pictograph and the bar graph — both very useful and meaningful ways of presenting information. Probably the most common graph used is the line graph. The line graph shows how measurements change.

Example 1

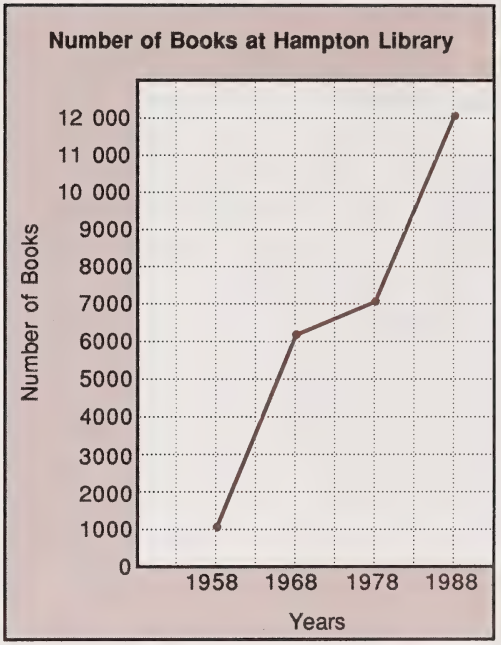
Do you recall the example about the growth in the number of books in Hampton Library?

Earlier in this module the information was displayed in a pictograph, a vertical bar graph and a horizontal bar graph.

This information can also be displayed in a line graph by plotting ordered pairs and joining the dots.

Number of Books at Hampton Library

Year	Number of Books	Ordered Pairs
1958	1 012	(1958,1 012)
1968	6 082	(1968,6 082)
1978	7 015	(1978,7 015)
1988	12 003	(1988,12 003)



Note

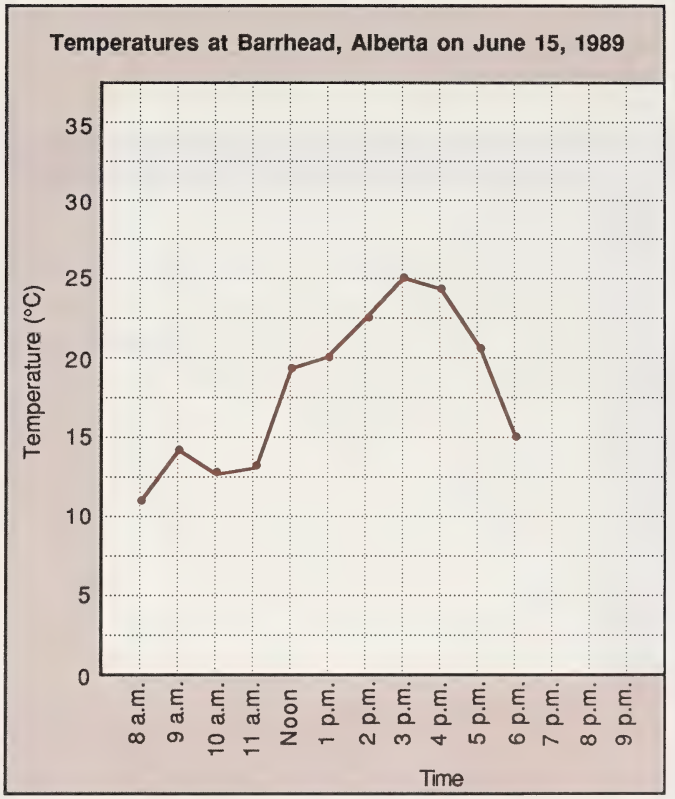
Because of the scale, the second numbers in the ordered pairs are approximate. Example (1988,12 003) is rounded to (1988,12 000).

Example 2

Gurtek had a research project to determine at what time of the day it was hottest. He took temperature readings from 8 o'clock in the morning (800 h) until 6 o'clock in the afternoon (1800 h). He collected the following data.

Time	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
Temperature (°C)	11	14	12	13	19	20	23	25	24	21	15

The data can be displayed on a line graph.

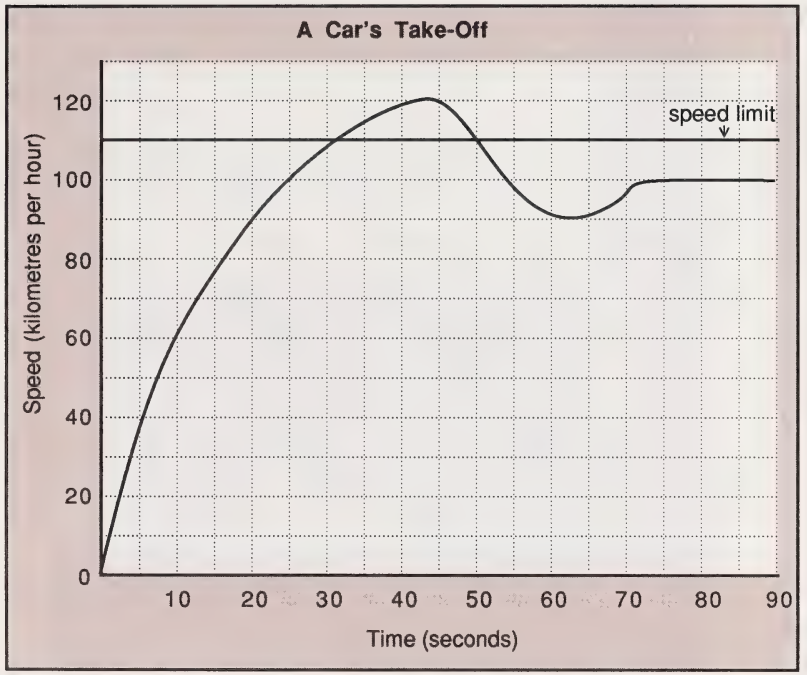


Note

Because of the scale, the dot is sometimes between the numbers on the vertical axis. Example (Noon,19). The dot is between 15 and 20 but closer to 20 on the vertical scale.

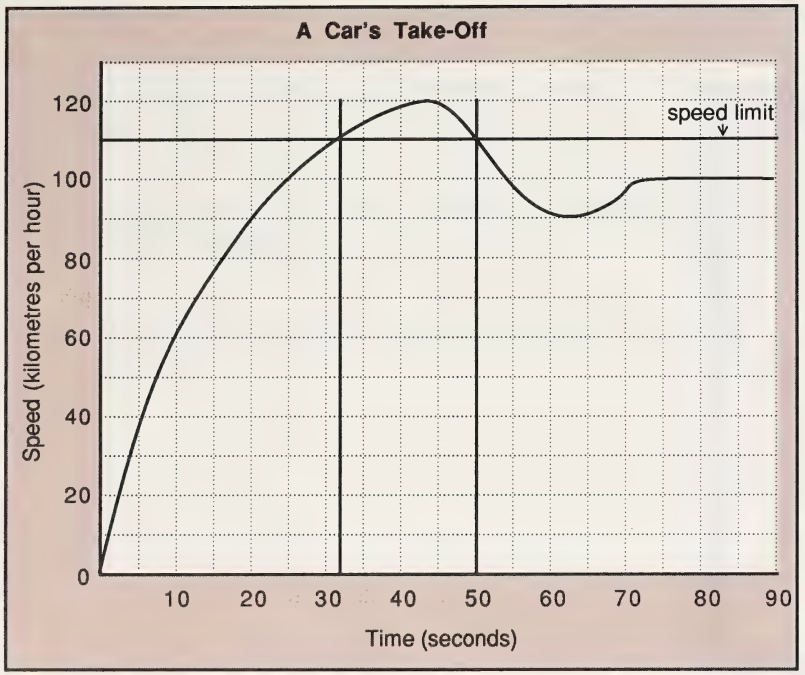
Example 3

The following graph shows the speed of a car for the first 90 seconds.



The speed limit is 110 km/h. Did the driver break the speed limit?

Solution

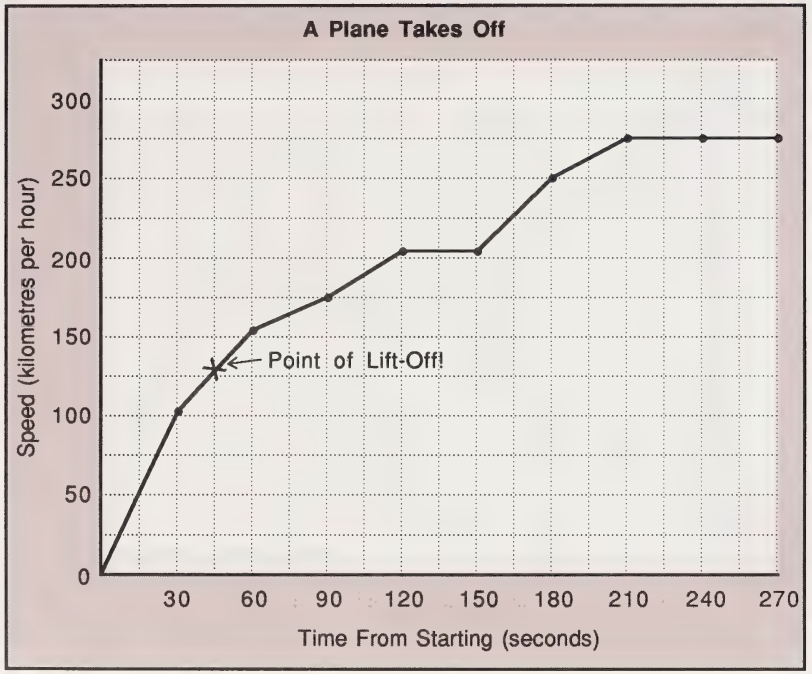


The driver was speeding between 32.5 seconds and 50 seconds.

Introductory Activities

Space for Your Work

1. Use the graph below to answer the following questions.



Space for Your Work

a. After how long did the plane become airborne?

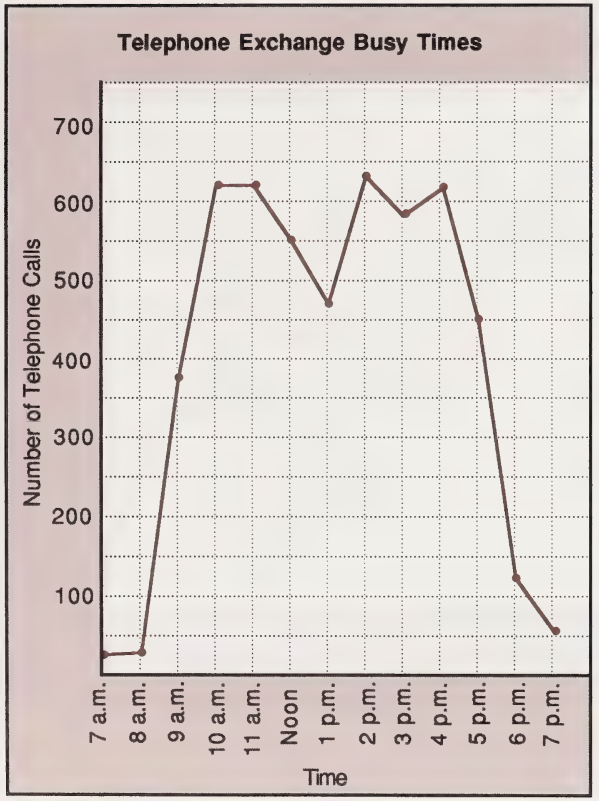
b. How fast was the plane travelling when it took-off?

c. Did it change its speed between 2 minutes and 3 minutes?

d. What was the highest speed attained by the aircraft?

Space for Your Work

2. Use the graph below to answer the following questions.



Space for Your Work

a. At what hours were there more than 500 calls going through the exchange?

b. Try to explain why most calls are made between 9 a.m. and 5 p.m.

c. Why would there be a drop-off in call between 12:00 and 1:00 p.m.?

See your learning facilitator to check your answers and to receive further instructions.

Working Together

Constructing Line Graphs

Line graphs should have these features.

- a descriptive title
- horizontal and vertical axis which are named accurately
- good use of space (appropriate scales)
- points which are connected by smooth lines.

When constructing a line graph, you should spend some time deciding on an appropriate scale for the horizontal axis and an appropriate scale for the vertical axis. the scales for each axis can be different.

Consider the highest value and the lowest value for each axis. Choose a scale that will allow you to plot all points and make a good use of space.

Example

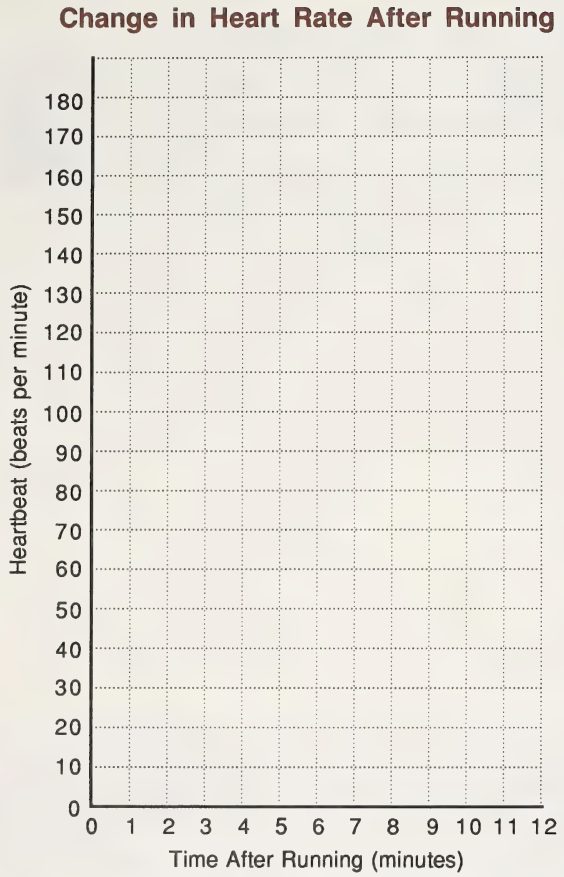
Changes Heart Rate After Running (at Rest)

Time After Running (min.)	Heart Rate (beats per minute)
0	180
1	165
2	150
3	135
4	120
5	110
6	100
7	95
8	90
9	85
10	80
11	80
12	80

Notice that time goes from 0 to 12 min. So you can make each unit 1 minute. Notice the heart rate goes from 80 to 180 beats per minute. So you can make each unit 10 beats per minute.

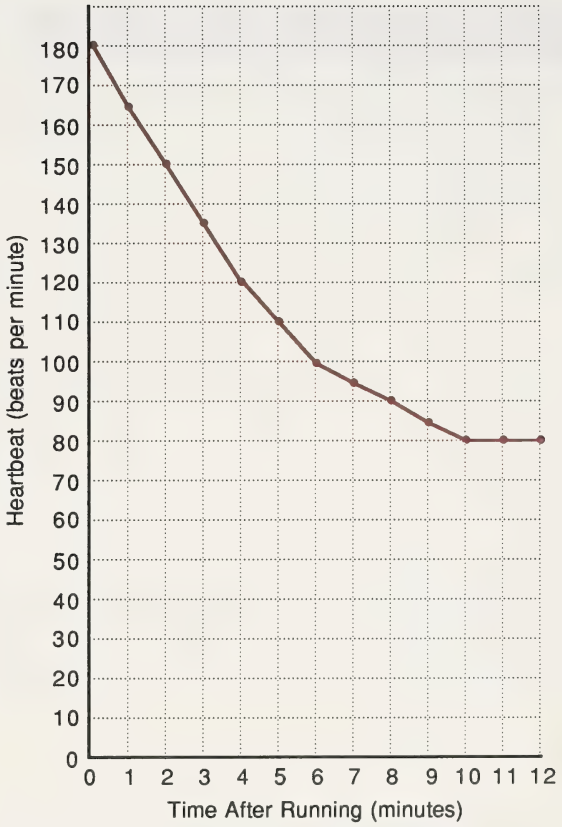
Step 1

Label the title and axis (including the scale).



Step 2

Plot the points and join the points.



Practice Activities

1. Below is data from McCarthy's Sporting Goods Store. Construct a line graph to display the data.

Months	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Sales of Skis	39	23	10	5	4	2	4	4	10	48	50	77

Space for Your Work

Space for Your Work

Computer Alternative

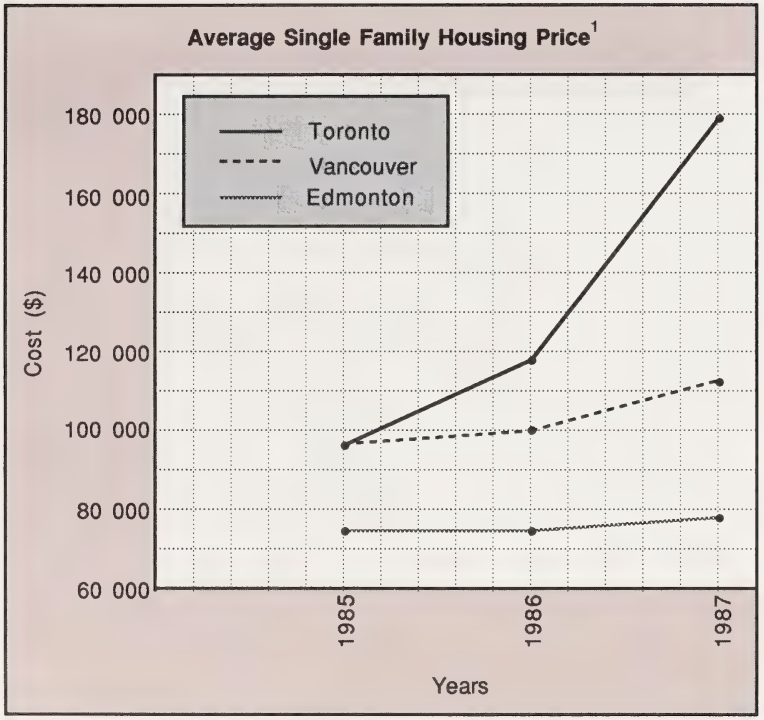
2. If you require further practice plotting a point, do Lessons 18 and 19 on the *Pre-Algebra disk of Computer Drill and Instruction: Mathematics, Level D* (SRA)

See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

Space for Your Work

1. Use the graph below to answer the following questions.



[1]Statistics Canada.

Space for Your Work

a. In which city did the houses cost the most in 1987?

b. In which city did the houses cost the least in 1987?

c. In which city did the price of houses change the least from 1985-1987?

Space for Your Work

2. For a science fair Susan decided to see which kind of logs burned the hottest and longest. She burnt 3 logs of the same weight. One log was poplar, one was tamarack and one was birch. She placed a thermometer in front of the fireplace and took readings every 5 minutes. Here are the results.

POPLAR	
Time	Temp.
0	20
5	24
10	27
15	28
20	34
25	35
30	35
35	34
40	30
45	28
50	26
55	25

TAMARACK	
Time	Temp.
0	20
5	23
10	27
15	27
20	28
25	30
30	32
35	34
40	34
45	30
50	30
55	27

BIRCH	
Time	Temp.
0	20
5	22
10	27
15	28
20	30
25	35
30	35
35	38
40	40
45	40
50	40
55	38

Display this information on a line graph. Use different colours to represent the three kinds of wood.

Space for Your Work

3. Use the graph you constructed in Question 2 to answer the following.

   a. Which kind of log got the hottest?

   b. How long did it take each of the following logs to reach its highest temperature?

      (i) poplar

      (ii) tamarack

      (iii) birch

   c. Which logs cooled-off the fastest?

   d. Why did each temperature start at 20°C?

See your learning facilitator to check your answers and to receive further instructions.

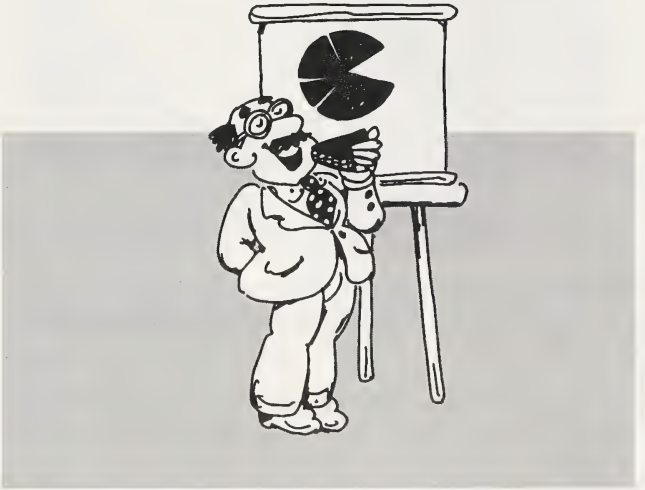
What Lies Ahead

In this section you will learn these skills.

- interpreting circle graphs
- drawing circle graphs

Working Together

In this section you will learn about another form of data presentation, the **circle graph**. Because a circle is cut up into pieces, it is sometimes called a **pie graph.**



Interpreting Circle Graphs

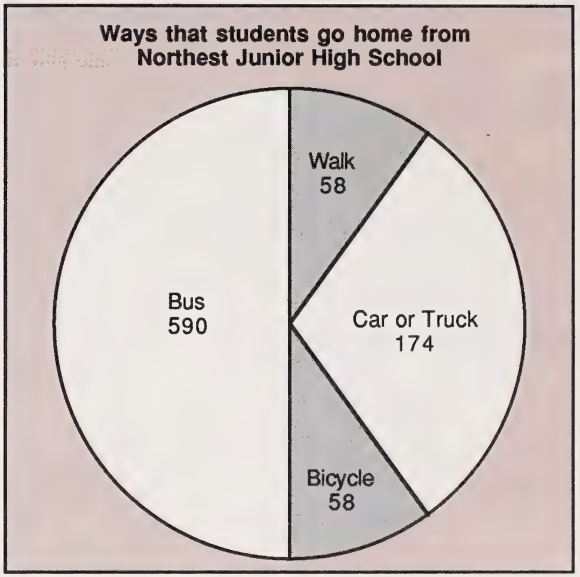
Circle graphs are easy to understand.

Example 1

Jane surveyed all the students at Northeast Junior High School to discover how they got to school.

	Number
Walk	58
Car/truck	174
Bicycle	58
Bus	590
Total	780

Jane then displayed this information in the circle graph at the right.



By merely glancing at the circle graph you should be able to see the following.

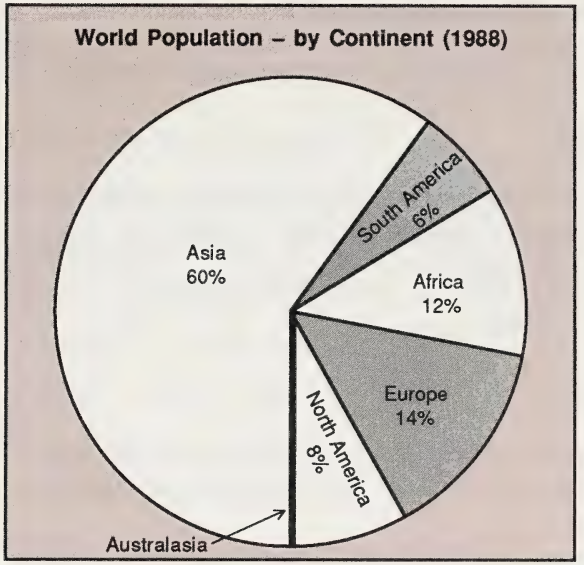
- Half of the students or 50% take the bus.
- About one-quarter of the students or 25% travel by car.
- About one-quarter of the students or 25% walk or bicycle.

Example 2

Krishnie discovers these facts about the world population.

- Asia has 60% of the world's population.
- Europe has 14% of the world's population.
- Africa has 12% of the world's population.
- North America has 8% of the world's population.
- South America has 6% of the world's population.
- Australasia has 1% of the world's population.

She makes this circle graph to display the information.



You should be able to see these facts.

- Asia has more than half of the world's population (remember China, India, and the USSR are part of Asia)
- Australasia has the lowest population shown. It is simply represented by a line on the circle graph.
- Europe has about the same population as North America and South America combined.

If circle graphs have percents attached to each sector instead of numbers, you can use your knowledge of percents to calculate the numbers.

Example

Use the circle graph on the previous page to find the number of people in Asia in 1988 and the number of people in North America in 1988. There were about 5 billion (5 000 000 000 people) in the world in 1988.

Solution

To do this multiply the percentage given for the particular continent by the total world population.

Number of People in Asia

$$
\begin{aligned}
&60\% \times 5 \text{ billion} \\
&= 0.6 \times 5\,000\,000\,000 \\
&= 3\,000\,000\,000 \text{ people} \\
&= 3 \text{ billion people}
\end{aligned}
$$

So there were about 3 billion people in Asia in 1988.

Note

This is not an exact answer even though you calculated the percent of the number. Both the total population (5 billion) and the percent (60%) are approximate.

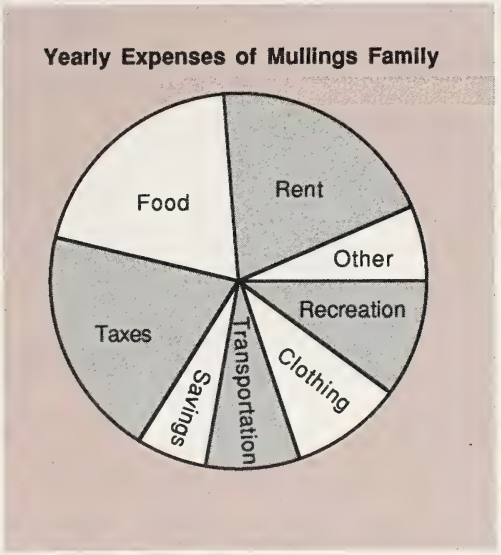
Number of People in North America

$$
\begin{aligned}
&8\% \times 5 \text{ billion} \\
&= 0.08 \times 5\,000\,000\,000 \\
&= 400\,000\,000 \\
&= 400 \text{ million}
\end{aligned}
$$

So there were about 400 million people in North America in 1988.

Some circle graphs do not have either numbers or percents attached to the sectors.

Example



At a glance you can see that the three biggest expenses are rent, food and taxes. You can also see what the other expenses are.

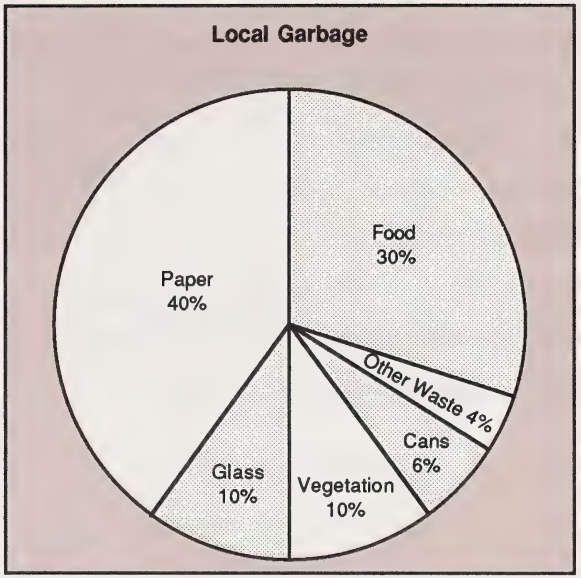
You could estimate the percents.

- Rent — about 20%
- Taxes — about 20%
- Food — about 20%
- Recreation — about 10%
- Clothing — about 10%
- Transportation — about 8%
- Saving — about 6%
- Others — about 6%

Introductory Activities

Space for Your Work

1. Look at the circle graph below and then answer the following questions.



   a. Of which kind of garbage is there the most?

   b. How many times as much paper is thrown out as vegetables?

Space for Your Work

c. In 1t (1 000 kg) of garbage, how many kilograms is there of

(i) glass

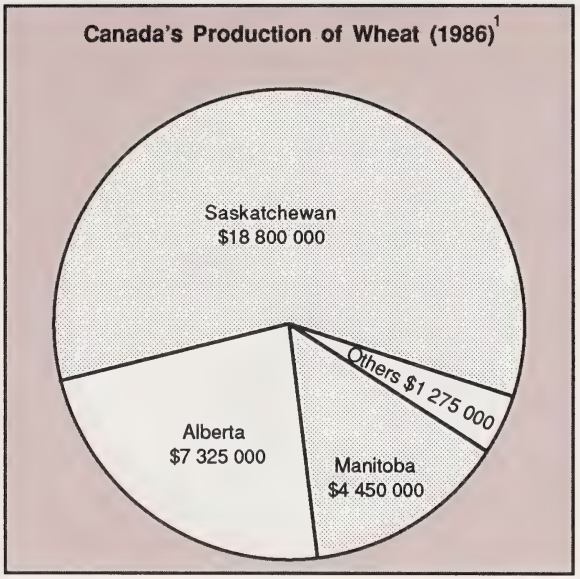
(ii) Cans

(iii) paper

d. If people could reuse the paper, the glass, and the cans, how much out of every 1 000 kg would have to be thrown away?

Space for Your Work

2. Use the graph below to answer the following questions.



[1]Statistics Canada.

Space for Your Work

a. Which province produced the most wheat?

b. About what percent of the total production of wheat is produced in each province?

(i) Saskatchewan

(ii) Alberta

(iii) Manitoba

Space for Your Work

Computer Alternative

3. For more practice estimating percents on a circle graph, do "Pie Graphics" on *Disk C of MAC 7* (Houghton Mifflin).

See your learning facilitator to check your answers and to receive further instructions.

Working Together

How to Construct Circle Graphs

Example

Beatrice spends her day doing these activities.

- working — 8 hours
- sleeping — 8 hours
- eating — 3 hours
- recreation — 5 hours

Construct a circle graph to display this data

Solution

Step 1 Calculate the fraction of the day spent doing each activity.

working $\frac{8}{24} = \frac{1}{3}$ or 33%

sleeping $\frac{8}{24} = \frac{1}{3}$ or 33%

eating $\frac{3}{24} = \frac{1}{8}$ or 13%

recreation $\frac{5}{24}$ or 21%

Step 2 Next calculate the angles and round to nearest degree

working 33% of 360°

$= 0.33 \times 360$
$= 119°$

sleeping 33% of 360°

$= 0.33 \times 360$
$= 119°$

eating 13% of 360°

$= 0.13 \times 360$
$= 47°$

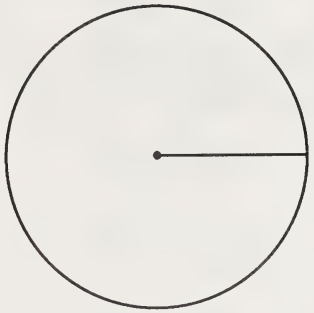
recreation 21% of 360°

$= 0.21 \times 360$
$= 76°$

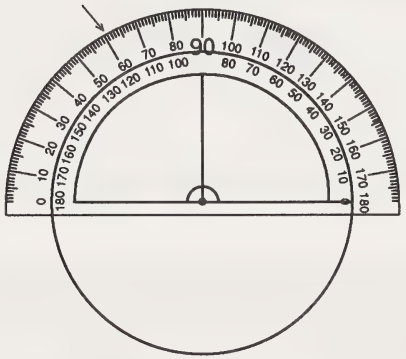
Note

Because of rounding the angles total 361° instead of 360°.

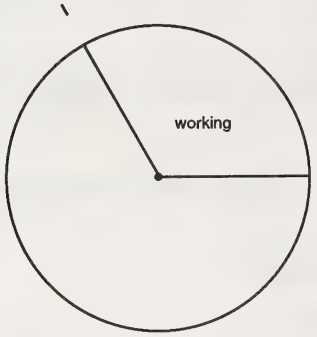
Step 3 Next draw a circle and an initial radius.



Step 4 Use this radius as a baseline and with a protractor measure an angle of 119° for the time spent working and mark off the angle.

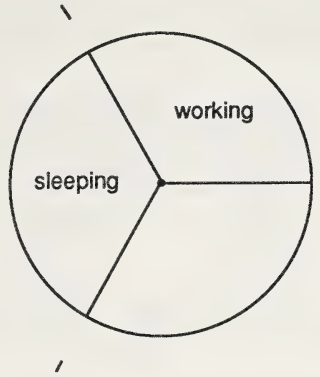


Step 5 Remove the protractor and join the measurement mark and label the sector.



Step 6 Use this new line you just drew as a base line to measure an angle of 119° for time spent sleeping and mark off the angle.

Step 7 Remove the protractor and join the measurement mark. Label the sector.



Step 8 Use this new line you just drew as a base line to measure an angle of 47° for the time spent eating.

Step 9 Remove the protractor and join the measurement mark. Label the sector.

Step 10 The remaining sector is the time spent on other activities. Label the sector.

Practice Activities

Space for Your Work

1. George Grant's net income each month is 2 000.00. Here's how he budgets the money.

Expenses	Cost
Mortgage and property taxes	$780
Food	540
Clothing	180
Medical	160
Transportation	100
Personal care	60
Gifts and entertainment	120
Household maintenance	60

Draw a circle graph to illustrate this data.

Space for Your Work

2. A package of cereal seen at a supermarket contained the following nutritional information.

Per Serving	
Nutrients	**Mass**
Protein	4.6 g
Fat	1.7 g
Sugar	13.5 g
Dietary Fibre	8.2 g

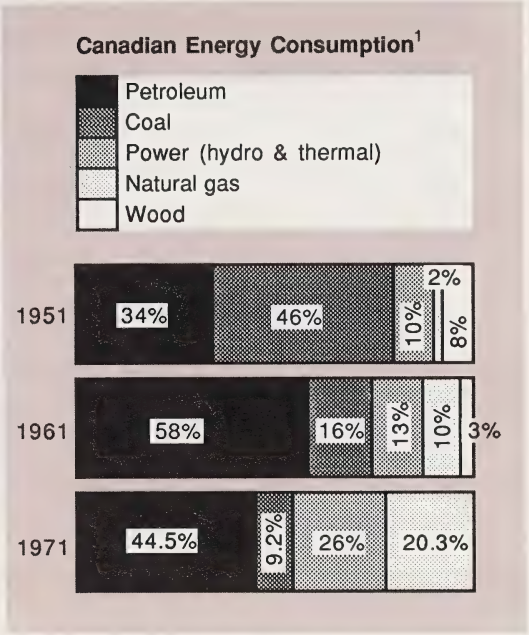
A serving is 28 g. Construct a circle graph to show the amount of each nutrient in a serving of the cereal.

See your learning facilitator to check your answers and to receive further instructions.

Concluding Activities

Space for Your Work

Circles are usually used to show percents, but other shapes such as rectangles can be "sliced" into percents. Consider the graph below.



[1]Statistics Canada.

Space for Your Work

1. What was the form of energy used the least

   a. in 1951?

   b. in 1961?

   c. in 1971?

2. a. Which form of energy decreased proportionally the most from 1951 to 1971?

   b. Which form of energy increased proportionally the most from 1951 to 1971?

See your learning facilitator to check your answers and to receive further instructions.

CHOOSING THE MOST APPROPRIATE GRAPH

What Lies Ahead

In this section you will learn this skill.

- choosing the appropriate graph to display data

Working Together

In this module you have discovered that data can be displayed in a graph.

Video Activity

Please view the video, *MATH WISE: Graphs — Locating and Interpreting.*

If you cannot view the video, please read the program summary.

Program Summary

Blanca wants to convince city council to put in traffic signals on Clark Street so there will be fewer accidents. She decides to use a graph to make her presentation more effective.

Comparing Graphs

Many people visited the Calgary Zoo during June-September, 1988, when the panda bears were at the zoo.

Number of Visitors to Calgary Zoo (1988)[1]

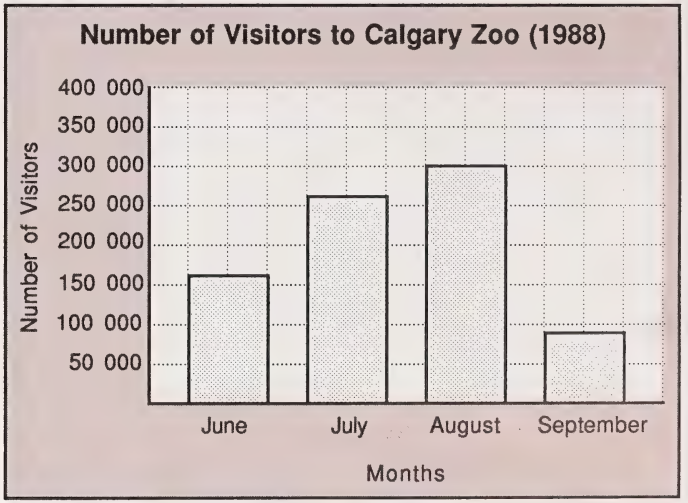
Month	Attendance
June	162 184
July	268 726
August	296 330
September	71 940

Compare the following graphs. They all display the same information.

Pictograph

Number of Visitors to Calgary Zoo (1988)	
June	☺ ☺ ☺ ◔
July	☺ ☺ ☺ ☺ ☺ ◔
August	☺ ☺ ☺ ☺ ☺ ☺
September	☺ ☺
Legend: Each ☺ represents 50 000 people	

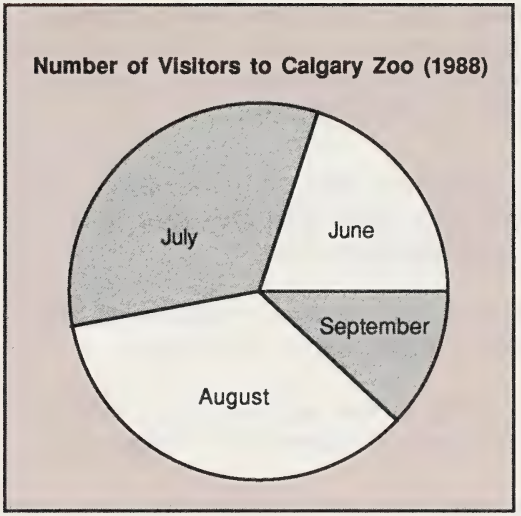
Bar Graph



[1]Calgary Zoo.

Line Graph

Circle Graph



Practice Activities

Space for Your Work

Given the following information, you are to choose which kind of graph would be **best** to represent the information (Choose from pictographs, bar graphs, broken-line-graphs, or circle graphs).

1. You want to show that 60% of the schools students come from farms and acreages while 40% come from the town itself.

2. You want to show to a group of 6-year-olds that Mount Everest is taller than a skyscraper.

3. You want to compare the populations of Toronto, Montreal, Vancouver, Edmonton and Calgary.

4. You want to track how far a rocket has gone from the time of its launch.

5. You want to show what sports Canadians like to watch the most — hockey 30%, football 25%, curling 20%, baseball 10%, figure skating 10%, others 5%.

6. You want to show the average temperature by month for the city of Victoria.

7. You want to show temperature change with increase in elevation.

Space for Your Work

8. You wish to show the money raised by various classes in a fund drive.

Class	Amount Raised	Percent of Total
Grade 7A	$ 60	20%
Grade 7B	$ 90	30%
Grade 7C	$120	40%
Grade 7D	$ 30	10%

9. You wish to show how many tourists came to Canada in 1981, 1985, and 1989?

10. You wish to show the trend in the Canadian demand for electricity from 1960 to 1990.

See your learning facilitator to check your answers and to receive further instructions.

What Lies Ahead

In this summary you will review these skills.

- calculating averages
- keeping tallies and making frequency tables
- constructing and interpreting pictographs, bar graphs, line graphs and circle graphs
- choosing the most appropriate graph

Working Together

At this point, it would be a good idea to review the skills taught in this module.

Turn to Section 1 and review the pretest. Then correct any errors you may have made at the time. You may be pleasantly surprised to discover how much you have learned!

MODULE CONCLUSION

What Lies Ahead

In this Module Conclusion you will complete the Module Assignment.

Working Together

Now that you have completed this Module Booklet, you should be ready for the Module Assignment.

Module Assignment

Turn to the Assignment Booklet and complete the assignment independently. You may refer to your notes, but do not get help from anyone.

Afterwards, submit the assignment for a grade and feedback.

What Lies Ahead

This section will prepare you for the final test.

The final test for Mathematics 7 is to be completed independently under supervision, without the use of any resources. A compass and straightedge will be needed. The use of a calculator, base 10 blocks and two-coloured counters is recommended.

The final test consists of three parts:

Part 1 — Multiple Choice
Part 2 — Short Answers
Part 3 — Problems

All grade 7 skills will be tested.

Good luck!

APPENDIX

GLOSSARY

Average: the quotient obtained by dividing the sum of a group of number by the number of addends

Bar graph: a diagram consisting of bars that represents data

Circle graph: a diagram in which a circle represents a whole and portions of the circle represents parts

Frequency: the number of times something occurs

Frequency table a table used to record the frequency of an event

Line graph: a diagram in which a line containing points represents data

Pictograph: a diagram that uses pictures to display data

Pie graph: a diagram in which parts of a whole are used to represent presents

Protractor: an instrument used to measure angles

Tally: symbols used in counting

 means 3

 means 5

 means 7

Mathematics 7

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